

Rejuvenation Instructions

#602 – Small Diameter Cables – iUPR



This NRI covers the following:

- The iUPR injection process for small diameter, URD sized cables.
- How to set up injection equipment.

Trademarks: <http://www.novinium.com/trademarks/>

Patents: <http://www.novinium.com/patents/>



WARNING: It is dangerous working around energized high-voltage systems, pressurized systems, and chemicals. Always work in accordance to the Novinium Field Operations Safety Handbook (FOSH) or other local governing safety standards.

Table of Contents

Installing Equipment	2
1. Feed tank and fluid injection cap.....	2
2. Receiver tanks.....	3
3. Pressurize feed tanks.....	4
Pre-Injection Check.....	4
1. Check for leaks.....	4
Recording Tank Levels.....	5
1. Record the injection start time and feed tank level.....	5
Starting the Injection	5
1. Check the flow.....	5
2. Flush water and other fluids.....	5
3. During the injection.....	6
Estimating Fluids	7
1. Estimate the current fluid supplied.....	7
2. Estimate the time for fluid to arrive.....	7
Fluid Arrival.....	8
1. Flush the cable.....	8
Recording Tank Levels.....	8
1. Record the injection end time and feed tank level.....	8

Installing Equipment

1. Feed tank and fluid injection cap.

- a. Close **all** the valves on the feed tank and the compact CO₂ kit.
- b. Connect the 6ft length of 1/4" OD x 0.05" ID tubing to the fluid injection cap (FIC). It can be shortened in the field.



Figure 1: The FIC.

- c. The feed tank comes with a ball valve, but a second valve can be placed in-line with the FIC.
 - Tanks are equipped with either quick disconnect (QD) or JACO fittings.
 - JACO fittings have shown to work better in colder temperatures.



Figure 2: JACO and QD fittings.

- d. Connect the tubing from the FIC to the feed tank's injection port (colored red).



Figure 3: Connect the FIC to the feed tank.

- e. Using ¼" tubing, connect the compact CO₂ kit to the feed tank's gas port (colored purple).
 - An in-line gauge can be added to help verify pressure sent to the feed tank.



Figure 4: Connect the compact CO₂ kit to the feed tank.

- f. Verify that the reticulated flash preventer (RFP) has been installed in the injection elbow and has been pre-wetted.
- g. Install the FIC onto the injection elbow.

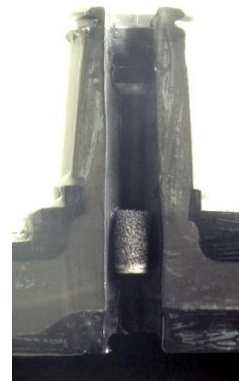


Figure 5: RFP in the injection elbow.

2. Receiver tanks.

- a. Draw a full vacuum into an empty UP-RCVR tank.
- b. Make sure the UP-RCVR tank's ball valve is closed.

- c. Connect a FIC to the UP-RCVR tank with the 6' length of 1/4" OD x 0.05" ID tubing. It can be shortened in the field.
 - Even though the UP-RCVR tank comes with a ball valve, a second valve can be placed in-line with the FIC, similar to the feed end.
- d. Verify that the RFP has been installed in the receiving elbow and has been pre-wetted.
- e. Install the FIC onto the injection elbow.
- f. Open all ball valves on the receiving end.
- g. The vacuum in the UP-RCVR tank will now drop as it pulls air from the cable.
- h. Pull the vacuum until the tank maintains a full vacuum.
- i. Check the tank for any leaks.
 - If any leaks are found, swap the UP-RCVR tanks for one that works or perform field repairs on the tank.
 - Contact Supply Chain for an exchange or if you need help.

3. Pressurize feed tanks.

- a. Slowly pressurize the feed tank to the **adjusted injection pressure (AIP)** determined from the pre-injection flow and pressure tests.
 - **Do not exceed 25psi for iUPR injection.**
 - For more information, refer to **NRI 352 Injection Pressure Selection**.
- b. Read the pressure on both the inline gauge and tank gauge.
 - The two readings should be close to each other.
- c. Check the tank for any leaks.
 - If any leaks are found, relieve all pressure immediately and fix the leak.
 - A pressure relief valve prevents hardware operation above the design pressure.
 - Do not tamper with the pressure relief valve.

Pre-Injection Check

1. Check for leaks.

- a. Before sending fluid straight to the cable, make sure each part of the injection assembly is leak-free.
 - If any leaks are found in the following process, close all valves, relieve pressure, and fix the leak.
- b. Double-check that **all** the valves on the feed tank, tubing, and gas tank are closed.
- c. Open the valve on the feed tank's injection port. This will send fluid to any ball valves between the feed tank and the FIC.
- d. Wait 3 to 4 seconds and watch for leaks.

Recording Tank Levels

1. Record the injection start time and feed tank level.

- a. Record the feed tank's starting fluid level in **millimeters** (mm) from the bottom of the meniscus in the sight gauge.
- b. Record the time the injection was started.
- c. Enter this information into Knomentous.

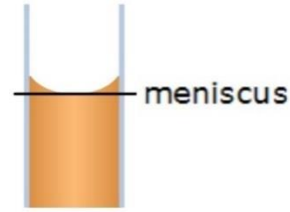


Figure 6: Read the level from the bottom of the fluid meniscus.

Starting the Injection

1. Check the flow.

- a. Open the valve to the FIC.
- b. Watch for any leaks from the FIC or the injection elbow.
- c. Verify flow into the cable by watching the sight gauge for a drop in level.

2. Flush water and other fluids.

- a. If water or other fluids are in the cable, it may be necessary to empty the UP-RCVR tank multiple times during injection.
- b. To measure the fluid flushed, transfer all fluids to a graduated flush bottle.



Figure 7: Transfer all fluids from the UP-RCVR tank to a graduated flush bottle.

- c. Let the bottle sit for a few minutes.
 - Water and other fluids should separate if left still.
- d. Read the water and fluid levels on the side of the bottle.
- e. Record all fluid and water flush and enter the total volume into Knomentous.

3. During the injection.

When the injection appears leak-free and stable, the crew can leave to begin injection at another location.

- a. Secure the feed and CO₂ tanks in the enclosure or near the termination.

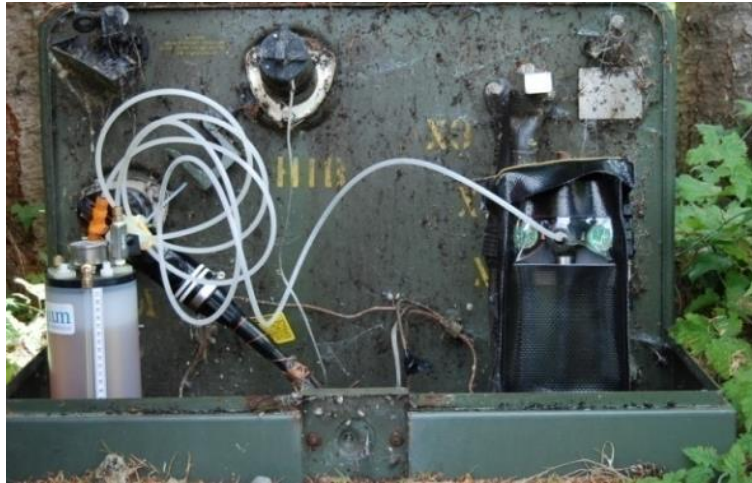


Figure 8: iUPR equipment placed inside the enclosure.

- If the feed tank must be placed horizontally, keep the sight gauge pointed up with the top of the tank elevated at least 3 inches above the bottom.
- CO₂ tanks **MUST** be upright.



Figure 9: iUPR feed tanks placed at an angle.

- b. Electrically isolate metallic portions of the tanks from energized components and grounds.
- c. The first foot of tubing attached to the cable must never contact any ground or other phase conductor.
- d. Minimize tubing contact with grounds beyond the first foot.
- e. The feed and receiver tanks and CO₂ tank are all protected or non-conductive.

- They can be left inside the transformer box or onsite for continuous injection.
- f. The cable can be re-energized now.
- g. Return periodically to check on the status of the feed and receiver tanks.
- h. Maintain the 25" Hg. vacuum in the receiver tank each time you check.

Estimating Fluids

1. Estimate the current fluid supplied.

- a. Take the current fluid level in **millimeters** (mm).
- b. Subtract the current level from the starting level.

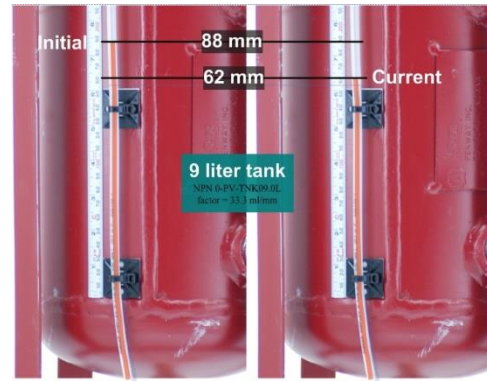


Figure 10: Find the start and current fluid level.

- c. To find the total fluid volume in cubic centimeters (cc), multiply the difference by the tank factor for the feed tank being used.
- Tank Factors can also be found on a sticker on the tank or in **NRI 412**.
- **1.5 Liter Tank Factor: 7.42 cc/mm**

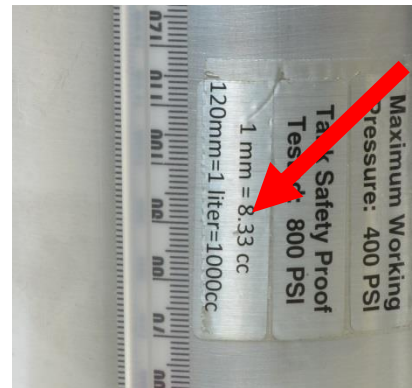


Figure 11: Tank factor sticker.

2. Estimate the time for fluid to arrive.

- a. Find how much time has passed since the injection began.
- b. Use **NRI 302 The Cable Table** to calculate the target fluid amount the cable will take in millimeters of tank height.
- c. Divide the calculated target by the millimeters of fluid currently injected into the cable.
- d. Multiply this number by the amount of time the injection has currently taken.
- e. This is the estimated amount of time left for injection.

Fluid Arrival

1. Flush the cable.

- a. Injection will continue until fluid fills the cup inside the UP-RCVR tank, where it automatically stops.
 - The cup holds 14cc of fluid.
- b. If the UP-RCVR tank fills with water or foreign fluid, disconnect and drain the UP-RCVR tank into a graduated flush bottle.
- Record this amount into Knomentous.
- c. When the UP-RCVR tank is filled with Novinium fluid, the injection is complete.



Figure 12: A filled UP-RCVR tank.

- d. Close the UP-RCVR tank's valves and swap it with a UP-REL bottle for 60 seconds to relieve any pressure in the cable.
 - Record this amount of fluid into the "Flush" field in Knomentous.



Figure 13: QD UP-REL bottle.



Figure 14: JACO UP-REL bottle.

Recording Tank Levels

1. Record the injection end time and feed tank level.

- a. Record the feed tank's ending fluid level in **millimeters** (mm) from the sight gauge.
- b. Record the time the injection ended.
- c. Enter this information into Knomentous.

- d. Enter the amount of fluid flushed from the cable into the “Flush” field.
 - If the UP-RCVR tank was fully filled, type “1”. Knomentous equates this to 14cc.
 - If more fluid is flushed than just in the UP-RCVR tank, change the receiver tank in Knomentous to one of the graduated flush bottles and enter the volume of fluid flushed from the cable.
- e. Enter the data into Knomentous.